Description

INS A1 >

Technical Field of The Invention

Method for exchanging signaling information for at least one call connection that can be switched via a packet-switched network

INS A2 >

Background of The Invention

The invention relates to a method for exchanging signaling information for at least one call connection, which can be switched via a packet-switched network, between subscribers of a circuit-switched network according to the preamble of claim 1.

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Accordingly, a network constellation as known, for example, from a customer brochure "EWSD goes Internet" by Siemens AG, Hofmannstr. 51, D-81359 Munich, published in 1997 under item number A50001-N2-P65-2-7600, figure on page 7, is used as a basis.

Accordingly, a circuit-switched network contains at least one digital originating exchange (local exchange 2) and at least one digital destination exchange (local exchange 1) which are in each case connected directly or indirectly via at least one digital transit exchange to an access node (POP) or in which the functions of such an access node are integrated. Such access nodes enable the originating, destination and/or transit exchanges to be connected to a packet-switched network, for example to the Internet. Subscribers of the circuit-switched network, the terminal facilities of which are connected to a digital exchange (originating or destination exchange, respectively) can thus set up a call connection to another subscriber of the circuit-switched network via the packed-switched network, for example by means of Voice over IP.

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The advantage of Voice-over-IP telephony mainly lies in that, by compressing the voice into data packets, approximately eight or more Voice-over-IP call connections can now be simultaneously transmitted

via one useful channel for a call connection of the conventional circuit-switched network with a transmission rate of, for example, 64 kbit/s. This reduces the costs to be borne by a network operator so that the network operator can offer favorable telephone charges to the subscribers using a Voice-over-IP call connection. On the other hand, the subscribers to the Voice-over-IP call connections have to accept a reduced voice quality compared with the conventional circuit-switched call connection.

To provide such a Voice-over-IP call connection to the subscribers of the circuit-switched network, the aforementioned originating or destination exchanges are connected to an access node to the Internet or the functions of such access nodes are integrated into an originating or destination exchange.

In such an access node, a so-called interworking unit for converting voice via a useful channel of the conventional circuit-switched telephone network (e.g. 64 kbit/s) into voice in the form of data packets to be transmitted via the Internet (Voice over IP = VOI) is provided. Furthermore, the following functions needed for VOI are implemented in an access node:

- a signaling function for connection set-up or clear-down for implementing telephone services (e.g. IN services) and for determining the outgoing transmission link (e.g. a useful channel of a PCM ring or a conventional data line). The signal information is also converted into data packets and transmitted to the destination exchange via the Internet.
- a billing function for the time-and destination-dependent billing for the VOI call connections,

- a traffic control function for evaluating destination numbers of conventional telephony (e.g. E.164) and for converting these into an Internet destination address.

This procedure represents a disadvantageous solution because the aforementioned VOI functions must be developed additionally to the signaling, billing and traffic control functions already present in a digital originating, destination or transit exchange within such an access node. This solution thus requires intensive development, is expensive and requires dual maintenance. In addition, there is at present no standardized signaling method of VOI call connections which is binding for all network operators.

It is, therefore, the object of the invention to develop a method of the type specified in the preamble of claim 1 to such an extent that the aforementioned disadvantages are eliminated.

This object is achieved by the features specified in the characterizing clause of claim 1. Further developments of the invention are characterized in the subclaims.

The principle of the invention consists in that the signaling information belonging to a call connection (e.g. VOI) to be transmitted via the packet-switched network is exchanged, instead of via the packet-switched network, via a signaling network, which is connected to the conventional circuit-switched network, between an originating and destination exchange of the circuit-switched network.

This is made possible by the circumstance that the signaling function for setting up and clearing down a connection and for implementing telephone services (e.g. automatic call back) are already implemented

in the digital exchanges, that is to say in the originating, destination and transit exchanges. In addition, the conventional circuit-switched network has a standardized independent signaling network, preferably CCS7. According to the invention, the signaling network available for the circuit-switched network is advantageously utilized for exchanging signaling information with respect to the call connections to be transmitted via the packet-switched network.

This dispenses with any expensive development of a special signaling function for call connections via the packet-switched network, for example via the Internet. Furthermore, the signaling function in an exchange of a circuit-switched network is already standardized so that signaling information can be exchanged between exchanges of different network operators or manufacturers.

An additional advantage of the invention can be seen in the fact that the traffic of signaling information, which normally puts a great load on the packet-switched network, is shifted to the signaling network connected to the circuit-switched network and, as a result, the packet-switched network is relieved of the load.

According to an advantageous development of the invention, the useful information to be transmitted via the packet-switched network, and its associated signaling functions to be conducted via the signaling network, are provided with a common, unambiguous identification number. As a result, signaling information transmitted via the signaling network can be associated in a simple manner in the exchange with the useful information transmitted via the packet-switched network.

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A further advantageous embodiment of the invention provides that, by means of such signaling information conducted via the signaling network, the billing method of the circuit-switched network can also be applied to such a call connection established via the packet-switched network. In this manner, the charging for call connections via the circuit-switched network and for such call connections set up via the packet-switched network can be unified and the administrative expenditure can thus be reduced. In addition, the billing method of the circuit-switched network has a high degree of security (e.g. the prevention of charge losses) which automatically also applies in the billing of call connections via the packet-switched network according to the present embodiment according to the invention.

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An advantageous further development of the invention relates to the case where there is a direct connection between the access nodes belonging to an originating exchange and a further access node belonging to a destination exchange or, alternatively, between the originating exchange and the destination exchange, in which the functions of such an access node are integrated. i.e., the data packets of a call connection to be transmitted via the packet-switched network are transmitted between two exchanges without intermediate nodes within the packet-switched network. With this assumption, the traffic control function present in the originating exchange can also be used for traffic control of the useful information, belonging to a call connection, in the form of data packets and the signaling information to be transmitted via the signaling network.

In the text which follows, an exemplary embodiment of the invention is described in greater detail with reference to a drawing.

The figure shows a network constellation to which the method according to the invention can be applied.

Terminal facilities A-Tln, for example a telephone set of a subscriber of a circuit-switched network, are connected to a digital exchange VST1 which will be called originating exchange in the text which follows. In the originating exchange, switching functions VT1 such as, e.g. signaling, billing and traffic control are implemented. Furthermore, a so-called interworking unit IWU1 is integrated in the originating exchange, in which voice is converted into voice in the form of data packets of variable or fixed lengths via a useful channel of the conventional circuit-switched network with a transmission rate of, for example, 64 kbit/s.

This correspondingly applies to a digital exchange VST2 which is called destination exchange in the text which follows. The terminal facilities, connected to the exchange VST2, of another subscriber of the circuit-switched network are identified by B-TLN and the switching functions implemented in the VST2 are identified by VT2 and the interworking unit is identified by IWU2.

Between the originating exchange VST1 and the destination exchange VST2, a number of connections are indicated. On the one hand, the originating and destination exchange are connected via a signaling network SN (e.g. CCS7). On the other hand, a number of useful channels or lines for useful information, e.g. p1, p2 and p3 originate at the originating exchange. In the figure, the useful channel or, respectively, the line p1 lead into a packet-switched network IN, for example the Internet or an ATM (Asynchronous Transfer Mode) network which is indicated in the form of a cloud and nodes contained therein, e.g. in the form of

network computers, with the aid of interconnected circles, and leads from there to the destination exchange VST2. The useful channel or line designated by p2

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represents a direction connection between the originating exchange and the destination exchange. A connection can be established to the destination exchange with the aid of the useful channel or the line p3 via a further digital exchange VST3 which handles the tasks of a transit exchange. A transit exchange normally has no subscriber lines and is connected between two exchanges having subscriber lines. In addition, the transit exchange is connected to the signaling network.

The possible connections between two digital exchanges described above can be in combination with one another or considered to be alternatives.

Assuming an A party wishes to set up a packet-switched call connection, e.g. Voice over IP or voice over ATM, with his terminal facility, e.g. A-Tln, to a B party with the terminal facility e.g. B-Tln.

To initialize a call setup, the A party uses a terminal facility, e.g. A-Tln, to trigger a loop closure and dials the number (e.g. E.164) of the B party. The signaling function implemented in the switching functions VT1 then transmits signaling information, e.g. in CCS7 format, with respect to the call setup request via the signaling network in the direction of the destination exchange addressed with the dialed number, e.g. VST2. The signaling information belonging to the desired call connection is provided with an unambiguous identification number which is preferably entered in the data section of the signaling information present, for example, in CCS7 format. The destination exchange sends a ring tone to a terminal facility, for example B-Tln of the B party. The B party accepts the call. The destination exchange VST2 is informed of this and the signaling function implemented in the switching

functions VT2 sends corresponding signaling information back to the originating exchange via the signaling network.

After the arrival of the returned signaling information in the originating exchange, the VOI call connection is established, for example in the form of a useful channel or a switched line, via a further function of the switching function VT1.

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In the simplest case, the traffic control function implemented in the switching function selects the useful channel or, respectively line e.g. p2, which leads directly to the destination exchange VST2 via the interworking unit IWU1, by means of the dialed number. The interworking unit is responsible for the conversion of voice via a useful channel of the circuit-switched network with a transmission rate of, for example, 64 kbit/s into voice in the form of data packets. Furthermore, these data packets are provided with the same identification number as their associated signaled information in order to ensure correct correlation between the signaling information and the useful information transmitted via useful channels or lines. The voice which has arrived at the destination exchange in the form of data packets, is converted back into voice via a useful channel of the circuit-switched network by means of the interworking unit IWU2 and transmitted in the direction of the terminal facility of the B party with the aid of the switching function VT2.

As an alternative to this, or in combination with the aforementioned case, the traffic control function implemented in the switching functions VT1 can convert the dialed number into a destination address of the packet-switched network (Internet address) and uses it to select the useful channel or, respectively, line, e.g. p1 via which a call connection to the destination exchange is established, with the aid of the interworking unit IWU, via the packet-switched network

IN (e.g. the Internet). Processing and forwarding of the incoming voice in the form of data packets in the destination exchange proceeds analogously to the method explained above.

Furthermore, the traffic control function implemented in the switching functions VT1 can select by means of the dialed number the useful channel or line, e.g. p3 which leads to the destination exchange not directly but via a transit exchange VST3. To be able to switch through the useful or call connection in the transit exchange, the transit exchange receives signaling information of the type specified above, both from the originating exchange and from the destination exchange.

In addition, a charge meter can be started by the billing function implemented in the switching function VST1 after arrival of signaling information, coming from the destination or transit exchange, in the originating exchange.

A method for clearing down the connection or, respectively, for implementing telephone services such as, e.g. automatic call back, can proceed analogously to the procedure described above.

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